What is Learning and How Do People Learn

Five important works summarized in ways that are relevant to the start-up of the new IHiS Academy

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Motivation for creating this summary: To identify insights from learning science and from applied workplace learning practice that can help to design and operate the IHIS Academy.

1. The context of IHIS

Integrated Health Information Systems
the Technology Agency for Singapore’s public healthcare sector

2. IHIS is creating an internal Academy to

- support the competency and capability development required for enabling ongoing transformation initiatives.
- support the ongoing transition to being a Learning Organisation.

3. How to bring relevant principles and findings from Learning Science and from Applied Workplace Learning Practice into the design and operation of the IHIS Academy?
The Five Works That Are Summarized Span Learning Science and Applied Workplace Learning Practice

**The Science of Learning**
*(in support of application and practice)*

**Learning Application and Practice**
*(informed by learning science)*

**Perspective 1:**
From an internationally recognized French cognitive neuroscientist who studies how education shapes the brain.

**Perspective 2:**
From an esteemed US National Academies committee of learning scientists from multiple disciplines.

**Perspective 3:**
From the faculty and staff of Carnegie Mellon University’s Center for Teaching Excellence and Educational Innovation.

**Perspective 4:**
From an accomplished L&D practitioner in large corporations, who went on to be a consultant and author.

**Perspective 5:**
From a Harvard Business School Professor who is an authority on business experimentation and innovation.
Perspective 1 on What is Learning and How Adults Learn

Book title: How We Learn: The New Science of Education and the Brain
Author: Stanislas Dehaene
Recipient of The Brian Prize, the highest award in neuroscience
Published by: Allen Lane division of Penguin Books, 2020

- Learning to learn is arguably the most important factor in academic success.
- All learners benefit from focused attention, active engagement, error feedback, and a cycle of daily rehearsal and nightly consolidation.
- These are the “four pillars” of learning. They lie at the foundation of the universal human learning algorithm present in all our brains, children and adults alike.
- While error feedback is essential, many children (and adults) lose confidence and curiosity because their errors are punished rather than corrected.
- Negative emotions crush our brain’s learning potential, whereas providing the brain with a fear-free environment may reopen the gates of neuronal plasticity.
- There will be no progress in education without simultaneously considering the emotional and cognitive facets of our brain.
- In today’s neuroscience, both (emotional and cognitive facets) are considered key ingredients of the learning cocktail.

(comments added by S. Miller)
How We Learn (Book): Relevant Summary Statements, con’t.

Four essential mechanisms or “pillars” massively modulate our ability to learn.

- **The first is attention:**
  - A set of neural circuits that select, amplify and propagate the signals that we view as relevant—multiplying their impact in our memory a hundredfold.

- **The second is active engagement:**
  - A passive organism learns almost nothing, because learning requires an active generation of hypotheses, with motivation and curiosity.

- **The third is error feedback:**
  - Whenever we are surprised because the world violates our expectations, error signals spread throughout our brain.
  - They correct our mental models, eliminate inappropriate hypotheses, and stabilize the most accurate ones.

- **The fourth is consolidation:**
  - Over time, our brain compiles what it has acquired and transfer it into long-term memory, thus freeing neural networks for further learning.
  - Repetition plays an essential role in the consolidation process.
  - Even sleep, far from being a period of inactivity, is a privileged moment during which our brain revisits its past states, at a faster pace, and recodes the knowledge acquired during the day.
How We Learn (Book): Relevant Summary Statements, con’t.

• What does “learning” mean?
  o To learn is to form an internal model of the external world.

• Seven key ideas that lie at the heart of present-day machine learning algorithms and that may apply equally well to our brains (though implemented in different ways) ---
  o Seven different definitions of what “learning” means:

1. Learning is adjusting the parameters of a mental model.
2. Learning is exploiting a combinatorial explosion.
3. Learning is minimizing errors.
4. Learning is exploring the space of possibilities.
5. Learning is optimizing a reward function.
6. Learning is restricting the search space.
7. Learning is projecting a priori hypotheses.

(comments added by S. Miller)
What is Artificial Intelligence missing?

• Here is a short and probably still partial list of functions that even a baby possesses (and adults as well) that most current artificial systems are missing:

• **Learning abstract concepts.**
  o Humans deploy an unmatched knack for abstraction.

• **Data-efficient learning.**
  o In the field of learning, the effectiveness of the human brain remains unmatched: machines are data hungry, but humans are data efficient.
  o Learning, in our species, makes the most from the least amount of data.

• **Social learning.**
  o Our species is the only one that voluntarily shares information: We learn a lot from our fellow humans through language.
  o Conscious knowledge comes with verbal reportability.
  o Whenever we understand something, a mental formula resonates in our language of thought, and we can use the words of language to report it.
How We Learn (Book): Relevant Summary Statements, con’t.

What is Artificial Intelligence missing, continued.

• One-trial learning.
  o An extreme case of this efficiency— when we learn something new on a single trial.
  o Some artificial neural networks are capable of storing a specific episode. But what machines cannot yet do well, and that the human brain succeeds in doing wonderfully, is integrate new information within an existing network of knowledge.
  o To learn is to succeed in inserting new knowledge into an existing network.

• Systematicity and the language of thought.
  o A particular talent in our brain is the ability to discover the general laws that lie behind specific cases.
  o The human brain manages to extract very abstract principles, systematic rules that it can reapply in many different contexts.
  o Systematicity, the ability to generalize on the basis of a symbolic rule rather than a superficial resemblance, still eludes most current (machine-learning) algorithms.

• Composition.
  o Humans can recombine what they learn with other learned skills.
  o In the human brain (in contrast to AI systems), learning almost always means rendering knowledge explicit, so that it can be reused, recombed, and explained to others.
  o Humans can use learning to reason, a logical inference that attempts to capture the rules of a domain.

(comments added by S. Miller)
Attention:

- In cognitive science, “attention” refers to all the mechanisms by which the brain selects information, amplifies it, channels it, and deepens its processing.
- Attention solves a very common problem: information saturation.
- This is why every student should learn to pay attention— and also why teachers should pay more attention to attention!
- If students don’t attend to the right information, it is quite unlikely they will learn anything.
- A teacher’s greatest talent consists of constantly channeling and capturing children’s attention (and the attention of adult learners) in order to properly guide them.
- Because of the severe effect of distraction, learning to concentrate is an essential ingredient of learning.
- Teaching requires paying attention to the limits of attention and, therefore, carefully prioritizing specific tasks.
- Attention in humans exhibits a unique feature that further accelerates learning: social attention sharing.
- In Homo sapiens, more than in any other primate, attention and learning depend on social signals:
  - I attend where you attend, and
  - I learn from what you teach me.

(comments added by S. Miller)
Attention, continued.

- A good teacher builds a mental model of his students, their skills and their mistakes, and takes every action to enrich his pupils’ minds.
- This ideal definition therefore excludes any teacher (human or machine) who merely mechanically delivers a stereotypical lesson, without tailoring it to the prior knowledge and expectations of his audience—such mindless, unidirectional teaching is inefficient.

- **Our Homo sapiens brain is equipped with two modes of learning:**
  - An active mode, in which we test hypotheses against the outside world like good scientists, and
  - A receptive mode, in which we absorb what others transmit to us without personally verifying it.
- The second mode, through a cultural ratchet effect, is what allowed the extraordinary expansion of human societies over the past fifty thousand years.
- But without the critical thinking that characterizes the first mode, the second becomes vulnerable to the spread of fake news.
- The active verification of knowledge, the rejection of simple hearsay, and the personal construction of meaning are essential filters to protect us from deceitful legends and gurus.
**Active Engagement:**

- Converging results from diverse fields suggests that a passive organism learns little or nothing.
- Efficient learning means refusing passivity, engaging, exploring, and actively generating hypotheses and testing them on the outside world.
- To learn, our brain must first form a hypothetical mental model of the outside world, which it then projects onto its environment and puts to a test by comparing its predictions to what it receives from the senses.
- This (human brain) algorithm implies an active, engaged and attentive posture.
- Motivation is essential.
  - We learn well only if we have a clear goal and we fully commit to reaching it.
- ...As soon a learning concerns high level cognitive properties....learning seems to occur only if the learner pays attention, thinks, anticipates, and puts forth hypotheses at the risk of making mistakes.
- Without attention, effort, and in-depth reflection, the lesson fades away, without leaving much of a trace in the brain.

*(comments added by S. Miller)*
Active Engagement, continued

• But what are the strategies that engage students the most?
• There is no single miraculous method, but rather a whole range of approaches that force students to think for themselves, such as
  o Practical activities, discussions in which everyone takes part, small group work, or teachers who interrupt their class to ask a difficult question and let the students think about it for a while.
  o All solutions that force students to give up the comfort of passivity are effective.
• In summary, while it is crucial for students to be motivated, active and engaged, this does not mean that they should be left to their own devices.
• The failure of constructivism shows that explicit pedagogical guidance is essential.
• Teachers must provide their students with a structured learning environment designed to progressively guide them to the top as quickly as possible.
• The most efficient teaching strategies are those that induce students to be actively engaged while providing them with a thoughtful pedagogical progression that is closely channeled by the teacher.
• Successful teachers provide a clear and rigorous sequence that begins with the basics. They constantly assess their students’ mastery and let them build a pyramid of learning.
Active Engagement, continued

- One of the foundations of active engagement is curiosity— the desire to learn, or the thirst for knowledge.
- Piquing children’s curiosity (and the curiosity of adult learners as well) is half the battle.
- Once their attention is mobilized, and their mind in search of an explanation, all that is left to do is to guide them.

A few hypotheses for why children (and adults) loose their natural sense of curiosity:

- They lack cognitive stimulation tailored to their needs.
- When their curiosity is punished.
- When the learning environment only tolerates or encourages the receptive mode of learning (through passive social transmission) and downplays or discourages the active mode (through generating and testing hypotheses).
- Mustering children’s active engagement (and adult learners’ active engagement) goes hand in hand with another necessity: tolerating their errors while quickly correcting them.

(comments added by S. Miller)
How We Learn (Book): Relevant Summary Statements, con’t.

Error Feedback:

• Making mistakes is the most natural way to learn.
• The two terms (learning and mistakes) are virtually synonymous, because every error offers an opportunity to learn.
• Errors always recede as long as we receive feedback that tells us how to improve.
• This is why error feedback is the third pillar of learning, and one of the most influential educational parameters:
  o The quality and accuracy of the feedback we receive determines how quickly we learn.
• It would be wrong to believe that what matters for learning is to make a lot of mistakes (without feedback).
• What matters is receiving explicit feedback that reduces the learner’s uncertainty.
• It is crucial to understand, however, that such error feedback has nothing to do with punishment. Error feedback should not be confused with punishment.
• ....What is the best way to incorporate our scientific knowledge of error processing into our classrooms (and workplace learning environments?) The rules are simple.
  o First, students (and adult learners in the workplace) must be encouraged to participate, to put forth responses, to actively generate hypotheses, however tentative, and
  o Second, they must quickly receive objective, non-punitve feedback that allows them to correct themselves.

(comments added by S. Miller)
Error Feedback, continued

• Regularly testing students’ knowledge (and the knowledge of adult learners in the workplace), a method referred to as “retrieval practice,” is one of the most effective educational strategies.

• Regular testing maximizes long-term learning.

• The mere act of putting your memory to the test makes it stronger.

• It (regular testing) is a direct reflection of the principles of active engagement and error feedback.

• Taking a test forces you to face reality head-on, to strengthen what you know, and to realize what you don’t know.

• To get information into long-term memory, it is essential to study the material, then test yourself, rather than spend all your time studying.

(comments added by S. Miller)
Error Feedback, continued

- Why does the alternation of studying and testing have such a positive effect?
  - Because it exploits one of the most effective strategies that educational science has discovered: the spacing out of training sessions.

- This is the golden rule:
  - It is always better to spread out the training periods rather than cram them into a single run.

- The best way to ensure retention in the long term is with a series of study periods, interspersed with tests and spaced at increasingly large intervals.

- Decades of psychological research has show that if you have a fixed amount of time to learn something, spacing out the lessons (over time) is much more effective than grouping them (within a short, compressed time span).
Error Feedback, continued
• What is the most effective time interval between two repetitions of the same lesson?
  o A strong improvement is observed when the interval reaches twenty-four hours, probably because sleep plays a central role in consolidating what we learn.
• Research has shown that the optimal interval depends on the desired duration of memory retention.
  o If you need to remember the information for only a few days or weeks, then it is ideal to review it every day for about a week.
  o If on the other hand, knowledge must be maintained for several months or years, the revision interval should be extended proportionately.
• The rule of thumb is to review the information at intervals of approximately 20 percent of the desired memory duration—
  o For example, rehearse after two months if you want a memory to last about ten months.
• The effect (of review and rehearsal) is substantial.
• In summary (the conclusions of learning science research show that)
  o First, learning always benefits from being spread over several sessions.
  o Second, reviewing after a few days or weeks is not enough. If you want to memorize something in the long run, you should review it after an interval of at least a few months.

(comments added by S. Miller)
Consolidation:

- Consolidation (of learning) happens in all domains. Consolidation is the shift from slow, conscious and effortful processing to fast, unconscious, and automatic expertise.

- Why is automatization (of learning through consolidation) so important? Because it frees up the cortex’s resources.

- Consolidation is essential because it makes our precious brain resources available for other purposes.

- Every night, our brain consolidates what it has learned during the day.

- This is one of the most important neuroscience discoveries of the past thirty years:
  - Sleep is not just a period of inactivity or garbage collection of the waste products that the brain accumulated while we were awake.
  - Quite the contrary: while we sleep, our brain remains active; it runs a specific algorithm that replays the important events it recorded during the previous day and gradually transfers them into a more efficient compartment of our memory.

- Sleep and learning are strongly linked.

- The sleeping brain does not absorb new information. It can only replay what it has already experienced.

- Nocturnal consolidation is not limited to the strengthening of existing knowledge.
  - The discoveries from the day are not only stored, but also recorded in a more abstract and general form.

(comments added by S. Miller)
Perspective 2 on What is Learning and How Adults Learn

Learning does not happen in the same way for all people because cultural influences are influential from the beginning of life. These ideas about the intertwining of learning and culture have been reinforced by research on many facets of learning and development.

Memory is an important foundation for most types of learning. Memory involves reconstruction rather than retrieval of exact copies of encoded mental representations. The cues available in a learner’s environment are critical for what she will be able to recall; they also play a role in the way the learner begins to integrate new information as knowledge.

Effective strategies to create organized and distinctive knowledge structures encourage learners to go beyond the explicit material by elaborating and to enrich their mental representation of information by calling up and applying it in various contexts.

Motivation to learn is influenced by the multiple goals that individuals construct for themselves as a result of their life and school experiences and the sociocultural context in which learning takes place. Motivation to learn is fostered for learners of all ages when they perceive the school or learning environment is a place where they “belong” and when the environment promotes their sense of agency and purpose.
Educators may support learners’ motivation by attending to their engagement, persistence, and performance by:

- helping them to set desired learning goals and appropriately challenging goals for performance;
- creating learning experiences that they value;
- supporting their sense of control and autonomy;
- developing their sense of competency by helping them to recognize, monitor, and strategize about their learning progress; and
- creating an emotionally supportive and nonthreatening learning environment where learners feel safe and valued.

“Learn” is an active verb; it is something people do, not something that happens to them.

- People are not passive recipients of learning, even if they are not always aware that the learning process is happening.
- Instead, through acting in the world, people encounter situations, problems, and ideas.
- By engaging with these situations, problems, and ideas, they have social, emotional, cognitive, and physical experiences, and they adapt.
- These experiences and adaptations shape a person’s abilities, skills, and inclinations going forward, thereby influencing and organizing that individual’s thoughts and actions into the future.
How People Learn II (Report): Relevant Summary Statements, con’t.

• Important types of learning:
  o Habit formation and conditioning
  o Observational learning
  o Implicit pattern learning (also referred to as statistical learning)
  o Perceptual and motor learning
  o Learning by making inferences (To make sense of their world, people often have to make inferences that while not certain to be correct, are necessary to move forward.)
  o Integrating across multiple types of learning

• Several principles for structuring practice and engaging with information to be learned to improve memory, to make sense of new information, and to develop new knowledge:
  o retrieval practice;
  o spaced practice;
  o interleaved and varied practice;
  o summarizing and drawing; and
  o explanations: elaborative interrogation, self-explanation, and teaching.
How People Learn II (Report): Relevant Summary Statements, con’t.

• Motivation is a condition that activates and sustains behavior toward a goal. It is critical to learning and achievement across the life span in both informal settings and formal learning environments.

• Goals—the learner’s desired outcomes—are important for learning because they guide decisions about whether to expend effort and how to direct attention, foster planning, influence responses to failure, and promote other behaviors important for learning.

• When learners want and expect to succeed, they are more likely to value learning, persist at challenging tasks, and perform well.

• Educators may support learners’ motivation by attending to their engagement, persistence, and performance by:
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  o supporting their sense of control and autonomy;
  o developing their sense of competency by helping them to recognize, monitor, and strategize about their learning progress; and
  o creating an emotionally supportive and nonthreatening learning environment where learners feel safe and valued.

• The bottom line is that tailoring instruction to the different motivations and abilities of individual learners is important for workplace training for people of all ages, and the same training intervention will not be equally effective for everyone.
How People Learn II (Report): Relevant Summary Statements, con’t.

• The effectiveness of workplace training is typically assessed in four ways:
  o **First,** immediately after training, surveys and other methods can be used to assess trainees’ reactions to and satisfaction with different aspects of the training.
  o **Second,** an evaluation, typically a knowledge test, can be conducted directly after the training has concluded to measure the knowledge acquired by each trainee.
  o **Third,** the extent to which the trainee has transferred what was learned in training back to the workplace can be assessed, usually by examining workplace behaviors after training has concluded.
  o The **fourth** indicator, which can also be measured, is the extent to which the organization benefits over time from the investment in training.
The following are important cultural elements that foster continuous workplace development:

- **Promoting a “big picture” perspective from which employees know what the goals organization are.**
  - This enables workers to align development with organizational goals.

- **Providing assignments that permit people to stretch beyond their job description.**
  - In learning organizations, people are assigned tasks that provide opportunities to do new things, learn new skills, and apply what they learn back on the job.

- **Fostering a climate where people can learn from their mistakes.**
  - In learning organizations, mistakes are tolerated, particularly when people are trying new things in the early stages of learning. Research suggests that error-prone practice can actually enhance learning, so if mistakes are tolerated, they can lead to greater development.

- **Making employees accountable for their own development.**
  - For example, performance evaluations might include ratings for engaging in autonomous career-related professional development.
Perspective 3 on What is Learning and How Adults Learn

WHAT IS LEARNING?

In this book, we define learning as a process that leads to change, which occurs as a result of experience and increases the potential for improved performance and future learning.

There are three critical components to this definition:

1. Learning is a process, not a product. However, because this process takes place in the mind, we can only infer that it has occurred from students’ products or performances.

2. Learning involves change in knowledge, beliefs, behaviors, or attitudes. This change unfolds over time; it is not fleeting but rather has a lasting impact on how students think and act.

3. Learning is not something done to students, but rather something students themselves do. It is the direct result of how students interpret and respond to their experiences — conscious and unconscious, past and present.
Seven Principles of Learning

1. Students’ *prior knowledge* can help or hinder learning.

2. How students *organize knowledge* influences how they learn and apply what they know.

3. Students’ *motivation* determines, directs, and sustains what they do to learn.

4. To develop *mastery*, students must acquire component skills, practice integrating them, and know when to apply what they have learned.

5. Goal-directed *practice* coupled with targeted *feedback* enhances the quality of students’ learning.

6. Students’ current level of *development* interacts with the social, emotional, and intellectual *climate* of the course to impact learning.

7. To become *self-directed* learners, students must learn to monitor and adjust their approaches to learning.

See [https://www.cmu.edu/teaching/principles/learning.html](https://www.cmu.edu/teaching/principles/learning.html) for a brief description of these seven principles.

Other useful reference websites about learning and teaching from Carnegie Mellon’s Eberly Center for Teaching Excellence and Education Innovation:

- [https://www.cmu.edu/teaching/teaching-as-research/index.html](https://www.cmu.edu/teaching/teaching-as-research/index.html)
- [https://www.cmu.edu/teaching/rsdigest/archive.html](https://www.cmu.edu/teaching/rsdigest/archive.html)

(comments added by S. Miller)
Principle 1: Students' **prior knowledge** can help or hinder learning.

- As people bring their prior knowledge, beliefs and attitudes into a course or learning environment, it influences how they filter and interpret what they are learning.
- If prior knowledge is robust, accurate and activated at the appropriate time, it helps learning.
- If prior knowledge is inert, insufficient, activated inappropriately, or inaccurate, it can interfere with or impede learning.
Principle 2: How students organize knowledge influences how they learn and apply what they know.

- When connections across pieces of knowledge form knowledge structures that are accurately and meaningfully organized,
  - students are better able to retrieve and apply their knowledge effectively and efficiently.

- When knowledge is connected in inaccurate or random ways,
  - students can fail to retrieve or apply it appropriately.
Principle 3: Students’ motivation determines, directs, and sustains what they do to learn.

- Motivation plays a critical role in guiding the direction, intensity, persistence, and quality of the learning behaviors in which they engage.
- Students are strongly motivated to learn when
  - they find positive value in a learning goal or activity, expect to successfully achieve a desired learning outcome, and perceive support from their environment.
Principle 4: To develop mastery, students must acquire component skills, practice integrating them, and know when to apply what they have learned.

- In addition to developing the component skills and knowledge necessary to perform complex tasks, students must also do the following to progress towards mastery:
  - practice combining and integrating the component skills and knowledge to develop greater fluency and automaticity, and
  - learn when and how to apply the skills and knowledge they learn.
Learning and performance are best fostered when students engage in practice that

- focuses on a specific goal or criterion,
- targets an appropriate level of challenge, and
- is of sufficient quantity and frequency to meet the performance criteria.

Practice must be coupled with feedback that

- explicitly communicates about some aspect(s) of students’ performance relative to specific target criteria,
- provides information to help students progress in meeting those criteria, and
- is given at a time and frequency that allows it to be useful.

Principle 5: Goal-directed *practice* coupled with targeted *feedback* enhances the quality of students’ learning.
How Learning Works (Book): Relevant Summary Statements, cont’.

Principle 6: Students’ current level of development interacts with the social, emotional, and intellectual climate of the course to impact learning.

- Students are not only intellectual but also social and emotional beings.
- We can shape the intellectual, social, emotional, and physical aspects of classroom climate in developmentally appropriate ways.
- Many studies have shown that the climate we create has implications for our students.
- A negative climate may impede learning and performance.
- But a positive climate can energize students’ learning.
Principle 7: To become *self-directed* learners, students must learn to monitor and adjust their approaches to learning.

- Successful learners need to engage in a variety of metacognitive processes to
  - monitor and control their learning—assessing the task at hand,
  - evaluate their own strengths and weaknesses,
  - plan their approach,
  - applying and monitor various strategies, and
  - reflect on the degree to which their current approach is working.
- Unfortunately, students tend not to engage in these processes naturally.
- When students develop the skills to engage these metacognitive processes, they gain intellectual habits that not only improve their performance but also their effectiveness as learners.
Perspective 4 on What is Learning and How Adults Learn

Book title: How People Learn: Designing Education and Training That Works to Improve Performance
Author: Nick Shackleton-Jones
Publisher: Kogan Page, 2019

• Learning is not knowledge transfer.
• A learner’s concerns (their ‘affective context’) will determine what they remember and how they remember it.
• This process is largely unconscious.
• Learning is defined as ‘a change in behaviour or capability as a result of memory’.
• Memory is defined as ‘the encoding of an affective response to an experience, which allows that experience to be reconstructed’.
• The building blocks of learning are not ‘facts’ or ‘knowledge’; instead they are ‘reactions’ and ‘stories’ and ‘experiences’.

• Because of the way that different people react differently to events, it is important to establish a connection to someone if you wish them to change in some way.

• Establishing a connection means understanding what matters to a person.

• Understanding what matters to a person is essential in designing learning and education, since these psychological features determine those things that they will react to, and a person’s reactions determine the way in which their experiences are encoded.

• **Without a connection, there will be no learning.**
• The affective context model makes a radical claim about memory:
  o we don’t actually remember any of the experiences that happen to us. Instead we store our
    reactions to those events - how they made us feel - and these reactions are used
    to ‘conjure up’ a memory when needed.
• ...Education and training will be haphazard and inefficient at best unless we have a systematic
  process for understanding what people care about (and therefore what they are likely to
  remember) at the outset, since it is their emotional reactions that are the building blocks of
  memory.
• ...Where people do care about something, ‘instructional design’ will matter very little.
  o They will quite happily Google the things they want to know.
• If we wish someone to learn something they care very little about, our main challenge will be to
  create an experience that causes a strong reaction, and shifts their concern.
  o Do not expect people to retain stuff that means very little to them.
Since our learning is governed by our concerns, which in turn determine whether or not something has affective significance for us, in any context we are either
- responding to the concerns that a person already has (‘pull’),
- or we are trying to create new concerns (‘push’).

**PULL:** Where people care about something, we do not need to provide affective significance. We can simply provide the resources they need.
- The vast majority of our learning is driven by the things we are trying to do, and which we care about. This is the ‘pull’ condition.

**PUSH:** Where people do not care about something, we need to provide affective significance. We cannot simply provide information and expect learning to take place.
- We need to provide an experience, such as a challenge, experience or story, that will add affective significance. This is the ‘push’ condition.
• **You cannot design effective learning experiences without understanding the people for whom you are designing them.**

• While this might seem like common sense, it is the single greatest mistake in learning design today.

• We focus on defining the content/topics that we want people to memorize and the mechanism that we will use to get it to them INSTEAD of analysing the concerns and contexts of the audience in question.

• We need to shift from content to context.

• I call the conventional approach to organizational learning programme ‘content dumping’.

• We take some “topics” that we want employees to know about, spray them with ‘knowledge’ and hope that some it sticks. Very little does, and still less translates into behavioural or capability change.
• **Push approaches to learning**
  - Designed experiences
  - Storytelling and observation
  - Status-dense situations
  - Simulation
  - Anxiety-based learning
  - Behaviour modification
  - Observational learning
  - Anticipatory learning
  - Trial and error, and play
‘Feedback’, in the context of the push condition, means having someone (or a system) describe to you some of the consequences of your behaviour that you might not be aware of.

We all have limits on our ability to sense the consequences of our actions.

For this reason, if you wish to continue to develop and learn throughout your lifetime, it is vital that you have as many sources of feedback as possible.

Otherwise, you will simply rise to the limit of your self-awareness and stay there.

People vary tremendously in their ability to receive and accept feedback.

- Some will become immediately defensive at the hint of negative feedback.
- Our sensitivities will tend to vary according to our cares— the more someone cares about a characteristic, the more sensitively the feedback must be handled.
Once you know that people care about something, it is best to build a resource (rather than building a training course.)

Resources are performance support. They are anything that is effective in helping you to tackle the task at hand.

Resources are not small bits of ‘micro-learning’ content.

A resource is task-centric, not topic-centric.

You can only create effective resources by talking to people and understanding the things that concern them, and what they are trying to do.

As a rule of thumb, people will use whatever is easiest in a given situation, and so unless your resource is the route of least resistance, people will choose the alternative.

When it comes to resources, simplicity is king.

Not only do the right resources need to be designed, they need to be accessible at precisely the points when people need them.
Tips for creating a performance support resource:
- Make it practical.
- Keep it short.
- Be visual.
- Design for use.
- Talk like a friend.
- Curate if you can (as in, know what is already available in the environment).
- Make it accessible.

Three ingredients for effective resources:
- Utility: they have to be genuinely useful.
- Accessibility: they have to be the easiest thing to access and use when and where people need to access them.
- Awareness: people need to know where the resources are.
• **When we provide effective resources**, we enable individuals with low levels of capability to perform to the standard of people with a high level of capability, and with a greatly reduced learning curve.

• This, in turn, transforms an organization’s resourcing strategy.
The 5Di Learning Design Model

1. **Define:** Rather than define learning objectives, clearly define the performance outcomes—what we are trying to help people do.

2. **Discover:** Uncover the tasks and concerns that are driving learning and behaviour in the current state.

3. **Design:**
   - Identify the resources we can create to address the existing set of tasks and concerns of our audience.
   - Identify the experiences we need to design to develop new concerns and capabilities.

4. **Develop:** Split the project into multiple parallel workstreams, and begin developing an MVP.

5. **Deploy:** Ensure that content is easy to access at the point of need, and that the audience is aware of it.

6. **Iterate:** Use feedback from the audience to gradually improve the usefulness of content and ease of access.
Four Approaches to Learning Evaluation:

1. Actually measure the performance you are looking to improve.

2. Talk to your learners.
   - They will tell you about the details of their struggles.
   - Have people describe how resources are being used to shift performance. Use this input to guide the activity data to be collected for measurement.

3. Give learners real work to do.
   - Learning is driven by challenges. Give people real challenges to work on.
   - Give people a license to experiment.
   - People learn more effectively by doing things than by assimilating content.

4. Award badges.
   - Badges of accomplishment are much powerful then certificates of course completion.
Achieving Business Alignment:

- If your basic approach to the design of learning programmes is topic- and content – centric, in other words, if your programmes largely involve gathering up content and dumping it on employees in an attempt to achieve business outcomes—
  - Then you will predictably fail to make any difference.
  - You will not achieve ‘business alignment.’
  - You will likely not achieve anything at all.
- To help solve the organisation’s problems and achieve business alignment, do not jump to conclusions on what it is that your employees should learn.
- Instead, focus on what it is that they should be able to do.
Achieving Business Alignment, continued:

- Talk to the people for whom you are designing the programme.
- Focus on uncovering the concerns and tasks currently occupying them.
- Understand *why* they are currently behaving the way that they do.
- Business alignment is not achieved by dumping content on people.
- Business alignment is achieved ‘bottom up’, not ‘top down.’
Learning Culture

- Culture exerts a powerful influence on our behaviour.
- Culture is a far more powerful influence on a person’s behaviour than the written rule.
- What people do in any given situation is largely the product of what they believe is expected of them.
- When people talk about a learning culture, they mean a culture in which learning flourishes:
  - Where people can learn quickly.
  - Where learning is easily shared.
Learning Culture, continued.

- By improving their learning culture, an organization can:
  - Improve performance since people more quickly learn the best ways to do things.
  - Reduce the time it takes for new employees to perform well.
  - Accelerate innovation and transformation.
  - Improve the experience of working for the organization, since people are not afraid of making mistakes, and are recognized for sharing their learning.

- However, the majority of attempts to improve learning culture are ineffective or misdirected!

- The root of the problem is a failure to understand that culture—and therefore learning culture—is something that permeates every aspect of an organization.
Changing a Learning Culture

• If you want people to care more about learning than they do today, you have to redesign the way employees experience the organization.

• Ways of doing this involve
  o Organizational values
  o Employee experience. (Failure to consider employee experience is probably the greatest oversight in implementing culture change programmes.)
  o Induction
  o Leadership
  o Catastrophe and follow-on story telling
  o Recognition
  o Appropriate use of digital social learning (as so much of current usage is not appropriate for changing a learning culture.)
Integrating Learning and Work

• Most corporate learning functions are not actually designed to help employees develop or to do their job.
• Rather, they are designed to push content at employees on the assumption that this will somehow help them to develop or do their jobs.
• But it doesn’t. And employees will always tell you this. Yet this feedback is usually ignored.

Steps for Integrating Learning and Work

Step 1: Shift from courses to resources.
• Creating resources is about externalizing knowledge in a usable format. These are support resources to improve performance, not content for the sake of learning.

Step 2: Shift from resources to guidance.
• Moving from passive support resources to active and context specific guidance systems.

Step 3: Shift from guidance to automation.
• More advanced automation where appropriate, and augmentation where appropriate.

(comments added by S. Miller)
How People Learn (Book): Relevant Summary Statements, cont’t.

Characteristics of a corporate learning organization that is in line with these principles:

• Emphasis on experience and performance improvement vs learning for its own sake.
• Emphasis on achieving performance challenges vs attaining capability levels.
• Designing for employee transition points and for organizational transitions, as much of learning ends up happening at transitions.
• Content creation is driven by user-centered design to help front line people do their jobs (and not driven by the mental models of disciplinary experts and other subject matter experts who are focused on content coverage for its own sake).
• Performance objectives are the focus of design efforts to support employees (and not designing content based on more abstract and uncontextualized learning outcomes).
• Focus on an employee’s performance journey and experience, and provide supporting resources and experiences in an integrated way to support this journey and its struggles (and do not organize content in ways that follows the siloed organizational structure).
• Iterative development vs static development.
Perspective 5 on What is Learning and How Adults Learn

Book title: *Experimentation Works: The Surprising Power of Business Experiments*
Author: Prof Stefan H. Thomke, Harvard Business School
Publisher: Harvard Business Review Press, 2020

- An experimental organization is a company
  - in which experimentation is embraced (in action and orientation) by every employee, from top to bottom.
  - where all employees participate in one way or another in an organization in which doing experiments is as salient at running the numbers.
- Where the organization’s ethos is to think experimentally.
- By combing the power of software and the rigor of controlled experiments, companies can turn themselves into learning organizations- turbocharged!
- But to unleash this power, you need to build an experimentation organization that
  - masters the science of testing and
  - has a culture, process and management system that contradicts what we value today.
How do decisions and experiments work together? What is a good experiment?

To answer these questions, and ensure that experiments yield better decisions, companies should ask themselves these seven important questions:

1. Does the experiment have a testable hypothesis?
2. Is there a commitment to abide by the results, whatever they may be?
3. Can our organization actually do the experiment?
4. How can we ensure the results are reliable?
5. Do we understand cause and effect?
6. Have we gained the most value from the experiment?
7. Is our organization really having our decisions driven by the work of experimentation?
• When managers actively encourage experimentation, the culture invites experiments.
• And when “failure” is understood as contributing to learning (i.e., not punished), experimentation is encouraged as well.
• An important lesson that we learn from those who have mastered large-scale experimentation is that they distinguish between “failures” and mistakes.
• Asking *why* something has failed is of the utmost importance.
  o Was the design of the experiment flawed, given the question being asked?
  o Was the question itself untestable?
• Organizations that have inculcated experimentation into their operations have learned themselves how success and failure work together in a paradoxical balance.
• As companies build experimentation capacity—either through in-house or third-party tools—they often find that the bottleneck to running more experiments shifts from technological difficulties to ones of culture.

• To build a true experimentation culture—including the shared behaviors, beliefs and values for large-scale and broad-scope testing—leaders need to ensure that their culture has these seven attributes:
  1. A learning mindset.
  2. Consistent rewards.
  3. Intellectual humility.
  4. Integrity.
  5. A trust for tools.
  6. An appreciation for exploration (and balancing exploration and exploitation).
  7. An ability to embrace a new leadership model.
Many companies, irrespective of their digital roots or customer channels, have learned that installing an experimentation tool is (relatively) easy.

However, changing an organization- its processes, management, and culture- takes time and patience.

To do so is a gradual maturing process, which can be described by five stages of management involvement: the ABCDE framework:

- Awareness,
- Belief,
- Commitment,
- Diffusion, and
- Embeddedness.
Becoming an experimental organization will undoubtedly cause frictions, as for every action there will be an opposing reaction.

The failure to understand and appreciate the true benefits of experimentation has given rise to fallacies that undermine innovation.

Here are the seven specific myths that I have come across:

- Myth 1: “Experimentation-driven innovation will kill intuition and judgement.”
- Myth 2: “Online experiments will lead to incremental innovation but not breakthrough performance changes.”
- Myth 3: “We don’t have enough hypotheses for large-scale experimentation.”
- Myth 4: “Brick-and-mortar companies don’t have enough transactions to run experiments.”
- Myth 5: “We tried A/B testing, but it had a modest impact on our business performance.”
- Myth 6: “Understanding causality is no longer needed in the age of big data and business analytics. Why waste time on experiments?”
- Myth 7: “Running experiments on customers without advance consent is always unethical.”
Experimentation Works (Book): Relevant Summary Statements, cont’t.

• Building a capability for disciplined business experimentation should not be left to specialized groups or functional departments.

• To build a true experimentation organization needs leadership from the top.

• The unfolding future provides the reasons for building experimental capabilities fast:
  o First, customers will increasingly interact with your company through mobile devices (smartphones, tablets, watches, etc.).
  o In parallel, advances in augmented reality (AR) give us a glimpse of the possibilities and requirements of entirely new customer experiences that will need a lot of exploring and optimizing.
  o Second, companies will soon recognize that a business analytics program is incomplete without controlled experiments.
  o The lesson here is that business analytics needs controlled experiments and vice versa, especially in the context of innovation.
The third and perhaps most significant development that will require massive experimentation capacity is the rise of artificial intelligence (AI)– or more specifically, machine learning and artificial neural networks.

- What if AI-based methods could analyze your data and generate thousands of evidence-based hypotheses?
- What if these algorithms could also design, run, and analyze experiments with no management involvement at all?
- What if large-scale experimentation programs using a closed-loop system can run in the background and make recommendations for action?

To participate in answering such questions– a company will have to go on the journey into the future: by becoming an experimentation organization.
Notes On This Presentation

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